Incremental Sampling: Win/Win for the FUDS MMRP SI Program

Deborah Walker, PMP, CHMM, RHSP
Environmental & Munitions Center of Expertise
US Army Engineering and Support Center, Huntsville

Brian Jordan
South Pacific Division Range Support Center
US Army Corps of Engineers,
Albuquerque District

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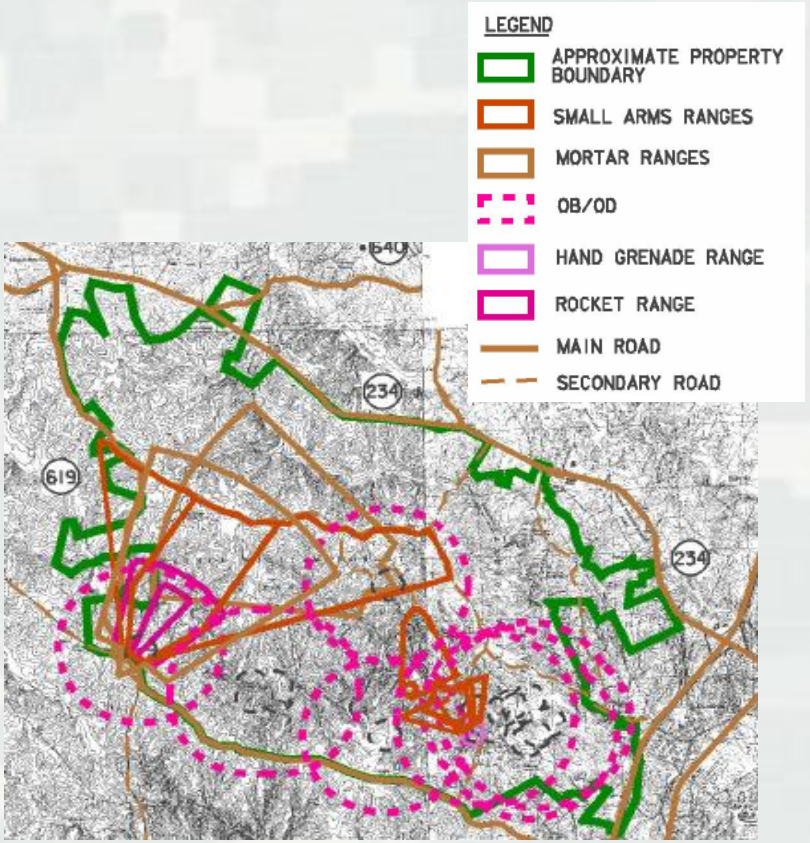
FUDS Program Overview

- Formerly Used Defense Sites (FUDS) are properties that were formerly owned, leased, possessed by, or otherwise under the jurisdiction of the DoD or military prior to 1986
- Program goal is to reduce risk to human health and the environment through implementation of effective, legally compliant, and cost effective response actions
- Customers are property owners and communities affected by these sites
- **For more information on FUDS or the FUDS MMRP SI program, please attend the FUDS session on THURSDAY afternoon!**



FUDS MMRP SI Scope & Objectives

- The current scope of the FUDS Military Munitions Response Program (MMRP) Site Inspection (SI) program is identified as 1086 projects.
- The primary objective of the MMRP SI is to determine whether the FUDS project warrants further response action pursuant to CERCLA and the NCP.
- The secondary objective is to collect data to complete the Munitions Response Site Prioritization Protocol (MRSPP)

Introduction to the MMRP Site Inspections

- USACE began work on the FUDS MMRP SIs in 2004 as part of a DOD-wide initiative to evaluate MMRP sites.
- USACE ER 200-3-1 requires Corps to use the Remedial Process framework for MMRP and to work in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil And Hazardous Substances Pollution Contingency Plan (NCP)

Initial Program Sampling Requirements

- 24 May 2005 PWS incorporates "DoD Quality Systems Manual (DoD QSM) (latest version)" by reference
  - DoD QSM in effect was dated May 2005 (Final Version 3)
- 2005 Government Furnished Programmatic Sampling and Analysis Plan also based on DoD QSM v. 3.0 and the USACE Munitions Constituents Tech Update, dated March 2005, which was later incorporated into EM 1110-1-4009
- Regional and site-specific plans tiered off this base plan to ensure consistency and acceptable level of quality

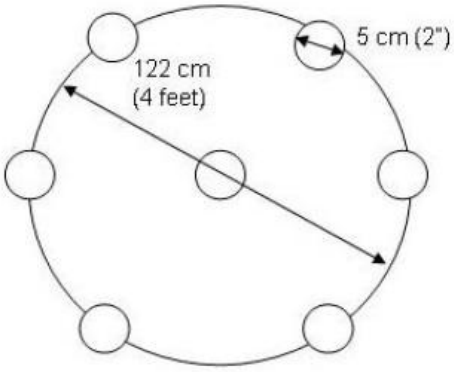


Figure 1 - CRREL 7 Sample Wheel Diagram

- For soil sampling, method chosen during Technical Project Planning:
  - 1st choice – "composite" technique, such as 7 point wheel described in ERDC/CRREL SR 96-15
  - 2nd choice – discrete

Initial MMRP SI Explosive Analysis Basis (SW8330A/8321)

- Programmatic audits were conducted in 2005 by EM CX staff prior to start of field work (STL Denver (now TA Denver) and GPL Laboratories (now Centauri Laboratories)
- Focus of audits for explosives was to confirm:
  - CRREL recommended laboratory-related improvements documented in FATE explosives module (http://www.clu-in.org/characterization/technologies/exp.cfm) were incorporated to the greatest degree possible
  - Current version of SW-846 in use (EPA 8330A)
  - Mortar/Pestle disaggregation IAW method
  - #10 sieve to separate soil fraction from debris
  - 10 g extraction volume used
  - Grab sub-sample from prepared material

Why Did Anything Change?

- Technology transfer initiatives independent of the MMRP were underway by CRREL and others
- FUDS MMRP SI Project teams began to receive inquiries about incremental sampling (IS), initially from Region 6 and HI
- SW 846 Method 8330B was published by USEPA (Nov 2006)
- Laboratory industry began to bring SW8330B online in early 2007
- Interstate Technology Regulatory Council IS Methodology Team was initiated (proposed in 2008, stood up in 2009); participation currently includes approximately 15 states

Stakeholder Driven Initiative

- HI required that all work on MMRP sites be performed with IS
- Region 6 and component states requested IS, but worked with the teams to be flexible as the new method took time to come on line at commercial laboratories and get into the contracting cycle; they participated in a training/partnering session to determine basic principles to follow for the sites in the region
- ID sites were contracted after the method publication and they requested all sites with explosives sampling follow the new method
- Recently, AZ has requested several pilot sites to better understand how IS performs and might be employed on MMRP sites in the future

Quality Considerations before the Switch

- Process and Documentation Changes
  - Field (Prime Contractors)
  - Laboratory (Subcontractors)
- EM CX reevaluated SI program laboratories for compliance with method SW8330B and for method preparation SOPs related to metals
  - TA Denver (then STL Denver)
  - Centauri Laboratories (then GPL Laboratories)
  - APPL (new program laboratory))
- EM CX evaluated request to use ball mill in lieu of puck mill
  - Puck mill only grinding technique explicitly allowed in the published method
  - Unable to satisfactorily determine equivalency for all site types
  - Puck mill determined only acceptable technique for FUDS MMRP SI program

Current Status of SI Program*

- 938 SIs have been awarded to date
  - Approximately 70 sites that are not complete include IS sampling
  - Approximately 20 sites that have not been awarded are anticipated to include IS sampling based on previous requests
- 653 SIs complete
  - 560 SIs included MC sampling
  - 105 of those SIs were conducted with IS

* Data as of 30-April-2010

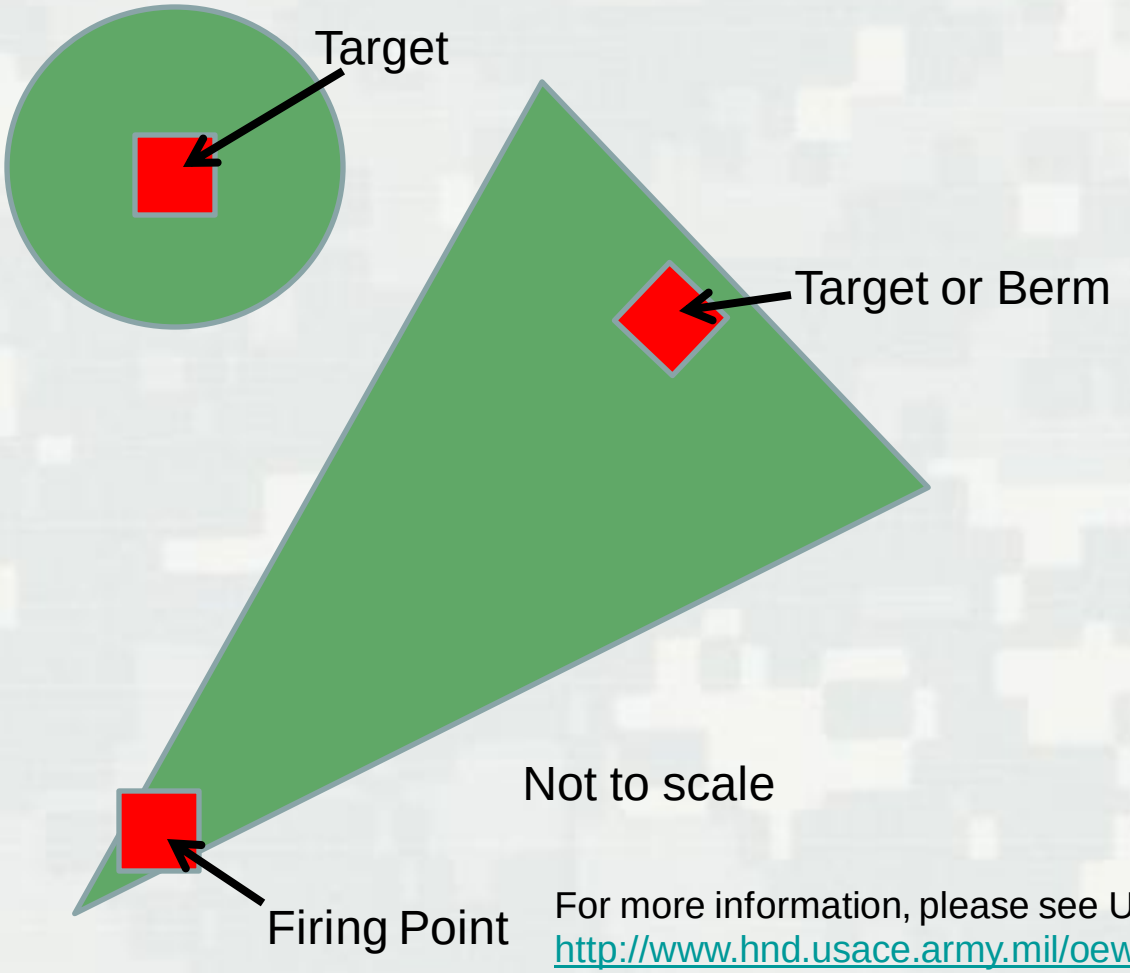
IS Universe for FUDS MMRP SIs

- Completed projects have been distributed across 6 states as shown
- 814 IS surface soil samples from a variety of range types

Project Distribution by State	
State	**Number Per State**
HI	21
ID	6
LA*	5
NM*	48
OK*	2
TX*	23

* Located in Region 6

Decision Units vs. Sampling Units

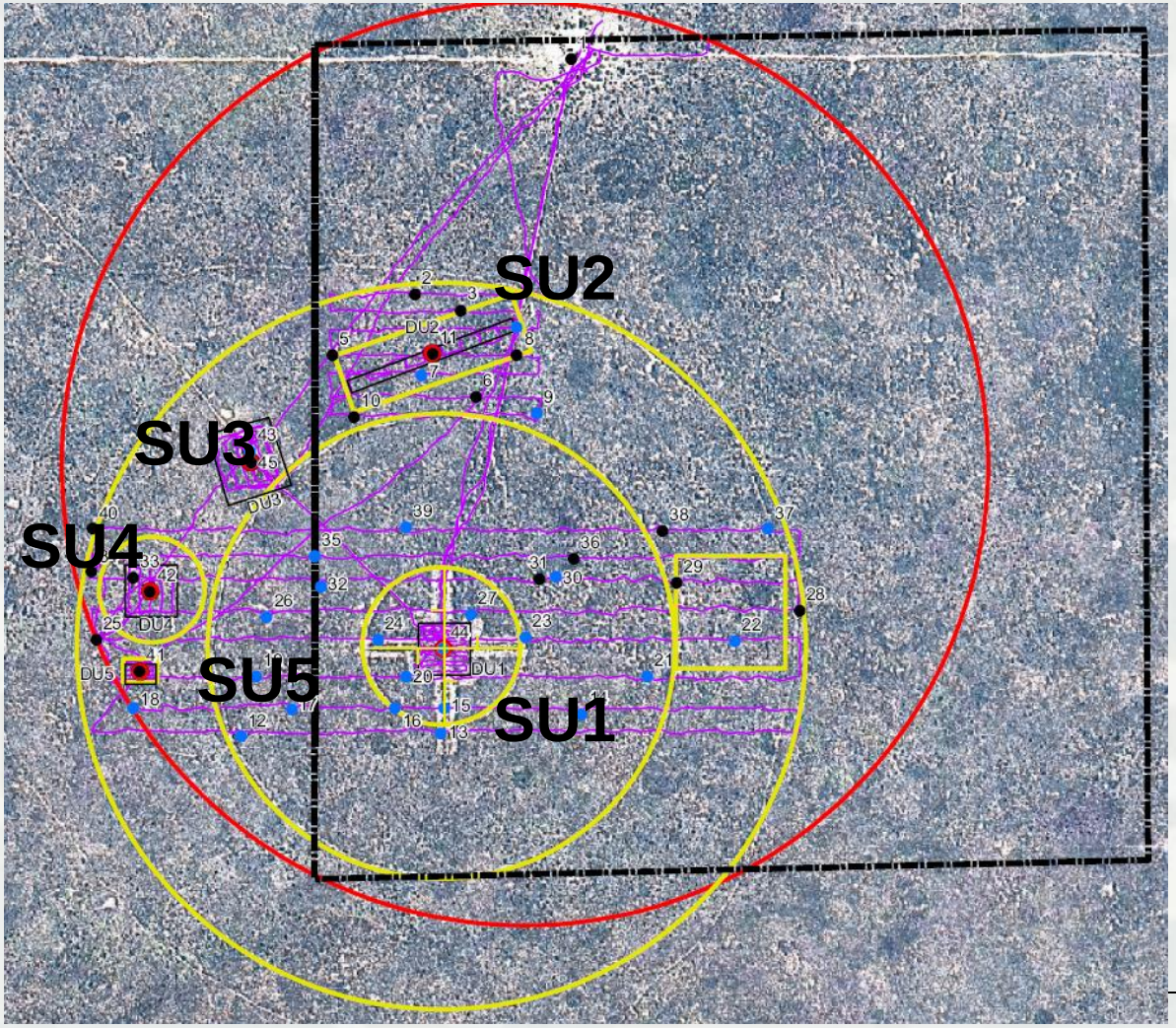


In the SI Phase, we are making decisions on Ranges. These ranges are typically too large to sample over as a "Decision Unit".

We have focused on "Sampling Units" within the ranges that focus on the most likely areas of contamination so that a decision can be made based on those samples.

For more information, please see USACE IGD 09-02, http://www.hnd.usace.army.mil/oew/interimguid.aspx

Typical IS Sampling Scheme for Region 6 FUDS MMRP SIs



Practice Bombing Range; typical acreage ~640 acres

FUDS Boundary

Sampling Unit Boundary

Approx Range Boundary = Decision Unit

Approx Feature Location

Feature Description:

SU1 Reverse Swastika
SU2 Battleship Target
SU3 Potential Target
SU4 Railhead Target
SU5 Train Target

IS Sample Results

- Residential criteria exceedances (# of exceedances) (highest value)
  - Benzo(a)anthracene – (2) 0.36 mg/kg
  - Benzo(a)pyrene – (8) 0.14 mg/kg
  - Benzo(b)fluoranthene – (6) 0.61 mg/kg
  - Cobalt – (5) 39 mg/kg
  - Dibenz(a,h)anthracene – (3) 0.097 mg/kg
  - Indeno(1,2,3-cd)pyrene – (1) 0.36 mg/kg
  - Lead – (7) 850 mg/kg
- Industrial criteria exceedances (# of exceedances) (highest value)
  - Lead – (1) 850 mg/kg

Primary range uses on these sites were small arms qualification, skeet, firing in-butts, etc.

IS Sample Results - Energetics

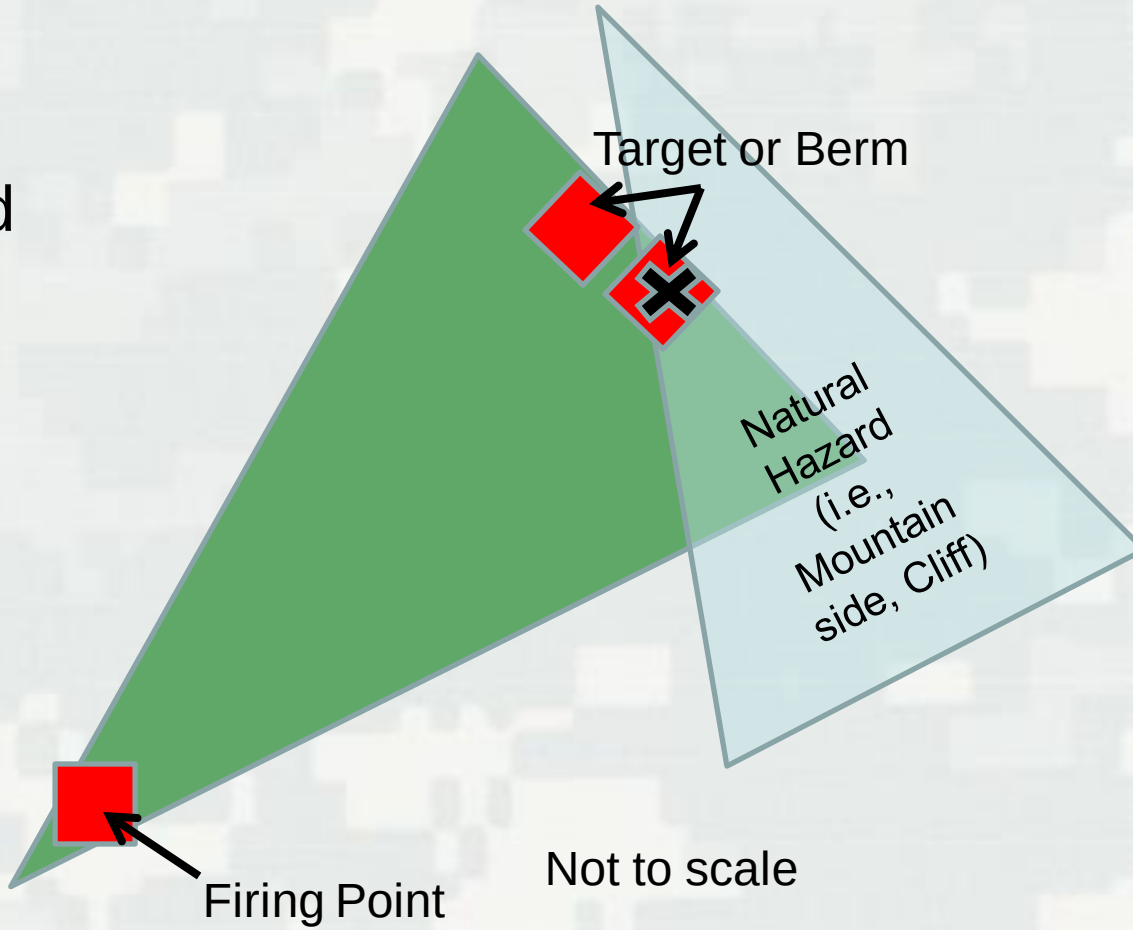
- 21 positive results for explosives, all below residential criteria; found at 8 sites
- Compounds found included (# of detections) (highest value):
  - 2,4-Dinitrotoluene (3) 0.19 mg/kg
  - Nitroglycerine (8) 0.76 mg/kg
  - 2-Amino-4,6-Dinitrotoluene (1) 0.75 mg/kg
  - 2,4,6-Trinitrotoluene (9) 0.95 mg/kg
  - Nitrobenzene (1) 0.018 mg/kg

IS - Lessons Learned

- Team understanding of IS is important – a good background in the basics for all decision-makers is key to making sure the agreements made are kept throughout the process
- IS can be a great good tool when used correctly, but your key players need to be on board for it to be successful
- Ensure sampling unit size is appropriate for screening criteria in use and is logistically feasible
- During planning, keep potential for unexpected in mind:
  - Discretionary sampling unit to apply based on site walk findings
  - Discretionary sampling unit for munitions that may be blown in place by others

IS - Lessons Learned

- Plan based on actual site conditions – sampling units should only encompass areas you can actually sample or you subvert the theory behind the process
- Consider access issues (jungle, forest, etc.) when you plan your SUs for the same reason



Win-Win for All Concerned

- The FUDS MMRP SI program has gained regulatory trust and better data by using innovation
- Use of the technique on future sites currently continues under the same conditions that it began:
  - If it is requested by the stakeholders and has regulatory acceptance
  - If it is technically appropriate for the site conditions
  - If it can be implemented in a cost effective manner
- The program and its contractors are willing to do their best to implement it!

Questions?

Deborah Walker
US Army Engineering & Support Center-Huntsville
Environmental & Munitions Center of Expertise
256-895-1796
Deborah.D.Walker@usace.army.mil
Brian Jordan
South Pacific Division Range Support Center
US Army Corps of Engineers, Albuquerque District
505-342-3472
Brian.D.Jordan@usace.army.mil